

Ser.no. 10/660,708
Amendment dated August 17, 2005
In Reply to Office Action dated February 18, 2005

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

Claims 1-10 (cancelled)

Claim 11 (new): A knuckle boom apparatus, comprising:

a machine base;

a hoist boom having a proximal end pivoted to the machine base, and a distal end remote therefrom;

a stick boom having a proximal end pivoted to the distal end of the hoist boom;

at least one hydraulic hoist cylinder mounted between said machine base and said hoist boom;

at least one hydraulic stick cylinder mounted between said hoist boom and said stick boom;

a hydraulic circuit for operatively supplying hydraulic oil to said cylinders, wherein said hydraulic circuit comprises an oil flow path between working ends of said hoist and stick cylinders so as to transfer hydraulic oil between said working ends; and

means for producing reach, comprising pump means connected to control said transfer of hydraulic oil between said working ends.

Claim 12 (new): A knuckle boom apparatus as in claim 11, wherein said pump means comprises a reversible flow pump connected between said working ends.

Claim 13 (new): A knuckle boom apparatus as in claim 11, wherein said pump means comprises an engine-driven variable displacement reversible flow pump connected between said working ends.

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Claim 14 (new): A knuckle boom apparatus as in claim 11, further comprising an engine-driven variable displacement reversible flow pump connected to operate said hoist cylinder and so as to be capable of recovering shaft torque energy from pressurized oil removed by said pump from the hoist cylinder.

Claim 15 (new): A knuckle boom apparatus as in claim 12, further comprising an engine-driven variable displacement reversible flow pump connected to operate said hoist cylinder and so as to be capable of recovering shaft torque energy from pressurized oil removed by said pump from the hoist cylinder.

Claim 16 (new): A knuckle boom apparatus as in claim 13, further comprising an engine-driven variable displacement reversible flow pump connected to operate said hoist cylinder and so as to be capable of recovering shaft torque energy from pressurized oil removed by said pump from the hoist cylinder.

Claim 17 (new): A knuckle boom apparatus as in claim 11, wherein said working ends of said cylinders are their respective base ends.

Claim 18 (new): A knuckle boom apparatus as in claim 12, wherein said working ends of said cylinders are their respective base ends.

Claim 19 (new): A knuckle boom apparatus as in claim 13, wherein said working ends of said cylinders are their respective base ends.

Claim 20 (new): A knuckle boom apparatus as in claim 11, wherein said working ends of said cylinders are their respective rod ends.

Claim 21 (new): A knuckle boom apparatus as in claim 12, wherein said working ends of said cylinders are their respective rod ends.

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Claim 22 (new): A knuckle boom apparatus as in claim 13, wherein said working ends of said cylinders are their respective rod ends.

Claim 23 (new): A knuckle boom apparatus as in claim 11, wherein said hydraulic circuit includes a valve which allows said pump to be bypassed, so that hydraulic fluid is then free to flow between the respective working ends of the cylinders, instead of that flow being controlled by operation of said pump.

Claim 24 (new): A knuckle boom apparatus as in claim 12, wherein said hydraulic circuit includes a valve which allows said pump to be bypassed, so that hydraulic fluid is then free to flow between the respective working ends of the cylinders, instead of that flow being controlled by operation of said pump.

Claim 25 (new): A knuckle boom apparatus as in claim 15, wherein said hydraulic circuit includes a valve which allows said pump to be bypassed, so that hydraulic fluid is then free to flow between the respective working ends of the cylinders, instead of that flow being controlled by operation of said pump.

Claim 26 (new): A knuckle boom apparatus, comprising:

a machine base;

a hoist boom having a proximal end pivoted to the machine base, and a distal end remote therefrom;

a stick boom having a proximal end pivoted to the distal end of the hoist boom;

at least one hydraulic hoist cylinder mounted between said machine base and said hoist boom;

at least one hydraulic stick cylinder mounted between said hoist boom and said stick boom; and

a hydraulic circuit for operatively supplying hydraulic oil to said cylinders, said circuit using two engine-driven computer-controlled reversible flow pumps connected to supply or remove oil in coordinated fashion from working ends of said cylinders, to capture mechanical energy by the engine from one said pump and use it in the other said pump.

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Claim 27 (new): A knuckle boom apparatus, comprising:

a machine base;

a hoist boom having a proximal end pivoted to the machine base, and a distal end remote therefrom;

a stick boom having a proximal end pivoted to the distal end of the hoist boom;

at least one hydraulic hoist cylinder mounted between said machine base and said hoist boom;

at least one hydraulic stick cylinder mounted between said hoist boom and said stick boom;

a hydraulic circuit for operatively supplying hydraulic oil to said cylinders, wherein said hydraulic circuit comprises an oil flow path between non-working ends of said hoist and stick cylinders so as to transfer hydraulic oil between said non-working ends; and

means for producing reach, comprising pump means connected to control said transfer of hydraulic oil between said non-working ends.

Claim 28 (new): A knuckle boom apparatus as in claim 27, wherein said pump means comprises a reversible flow pump connected between said non-working ends.

Claim 29 (new): A knuckle boom apparatus as in claim 27, wherein said pump means comprises an engine-driven variable displacement reversible flow pump connected between said non-working ends.

Claim 30 (new): A knuckle boom apparatus as in claim 27, further comprising an engine-driven variable displacement reversible flow pump connected to operate said hoist cylinder and so as to be capable of recovering shaft torque energy from pressurized oil removed by said pump from the hoist cylinder.